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Original Article

Reduced emergence agitation with proparacaine hydrochloride eye drops after general anaesthesia for paediatric strabismus surgery

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ABSTRACT

Purpose: To investigate the effect of proparacaine hydrochloride eye drops on emergence agitation after general anaesthesia for paediatric strabismus surgery.

Methods: Paediatric patients (3–12 years-old) receiving strabismus surgery were randomly assigned to receive 1–2 drops of isotonic saline ($n = 129$) or proparacaine hydrochloride ($n = 129$) after surgery. The incidence and degree of emergence agitation were recorded and compared between groups.

Results: A significantly lower occurrence of emergence agitation was observed with proparacaine hydrochloride drops compared to isotonic saline (12.4% *vs.* 31.8%; $p < 0.05$).

Conclusion: Proparacaine hydrochloride eye drops reduce the incidence of emergence agitation after general anaesthesia for paediatric strabismus surgery.

1. Introduction

Strabismus is a common ocular disease that affects the appearance and normal visual development of children [1], and is typically treated with surgery under general anaesthesia. The incidence of emergence agitation after surgery in children is high [2], which can influence the safety of the operation and postoperative effects. According to recent studies, pain is the primary cause of emergence agitation [3–5]. The purpose of this study was to investigate the safety of anaesthetic eye drops, proparacaine hydrochloride, and their effect on emergence agitation after general anaesthesia for paediatric strabismus surgery.

2. Methods

2.1. Subjects

This study included 258 paediatric patients (3–12 years of age) of American Society Anaesthesiologists physical status I or II with strabismus that were scheduled for extraocular muscle surgery at the Eye Hospital of Wenzhou Medical University

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between June 2013 and January 2014. Patients were excluded from the study if they had cardiopulmonary diseases, upper respiratory tract infection, or had previously undergone an operation with anaesthesia. Patients were randomly assigned to control or experimental groups ($n = 129$ each).

2.2. Anaesthesia induction

All patients were fasted for 6–8 h prior to surgery without preanaesthetic medication. Anaesthesia was induced by an intravenous injection containing propofol (2–3 mg/kg), remifentanil (1 μg/kg), atropine (0.015 mg/kg), and cisatracurium (0.2 mg/kg). Electrocardiography, oxygen saturation, and noninvasive blood pressure were continuously assessed throughout the surgery with a standard anaesthesia monitor. After tracheal intubation, pressure-controlled ventilation, with a peak airway pressure of 10–15 cm H_2O according to weight, was used to maintain the end-tidal CO_2 values between 35 and 45 mmHg. Anaesthesia was maintained by a continuous infusion of propofol (2–3 μg/mL) and remifentanil (2–3 ng/mL), and with 1% sevoflurane, which was stopped 20 min before the end of the surgery.

2.3. Experimental treatment

At the end of the surgery, patients in the control group received 1–2 drops of isotonic saline, whereas 1–2 drops of proparacaine hydrochloride (0.5%) were administered to each eye of patients in the experimental group. Intravenous anaesthesia was discontinued, and the tracheae were extubated once spontaneous breathing resumed. Patients were transferred to the post-anaesthesia care unit when tidal volume was >8 mL/kg, oxygen saturation was >95% on room air, end-tidal CO_2 pressure was <45 mmHg, and the deglutition reflex partially recovered.

2.4. Outcome measure

A well-trained observer blind to the treatment grouping was assigned to assess and rate emergence behaviours using the five-point scoring system for emergence agitation [6]: 0, asleep; 1, awake and calm; 2, irritable or with consolable crying (mild agitation); 3, inconsolable crying (moderate agitation); 4, severe restlessness (severe agitation). Emergence agitation was defined as a score ≥2. The surgeon evaluated the corneas on the 1st postoperative day.

2.5. Statistical analysis

Data were analysed with SPSS version 17.0 (SPSS Inc., Chicago, IL, USA) statistical software. Groups were compared using an independent-sample Student's t or χ^2 tests, where appropriate. The incidence of emergence agitation between the groups was compared using a Wilcoxon rank-sum test. A p value <0.05 was considered to be statistically significant.

3. Results

Baseline patient and operative characteristics, such as age, gender, and duration of anaesthesia and surgery, did not differ between the control and experimental groups (Table 1). Furthermore, the distribution and number of extraocular muscles operated on did not differ between groups.

The emergence agitation scores are presented in Table 2. Overall, a significantly smaller proportion of patients in the experimental group (16/129; 12.4%) showed emergence agitation compared to the control group (41/129; 31.8%) ($Z = -5.638$; $p < 0.05$). The corneas were transparent on the 1st postoperative day, without epithelial exfoliation.

4. Discussion

Children who receive ear, nose, throat, or ocular surgery have a higher incidence of agitation during recovery than with other surgeries [7]. Although typically of only short duration, emergence agitation in children with strabismus can have serious consequences, including falling out of bed, removal of the venous tubing, disruption and haemorrhage of the wound, or even operative failure. Emergence agitation is caused by pain in 49.35% of cases [8], for which postoperative analgesia can reduce the incidence by 68.6% [9]. Indwelling catheters are a common source of agitation-inducing pain [4,5], though they were not used in the present study because of the short duration of the strabismus surgery. Previous work has shown that intravenous narcotics and sub-Tenon lidocaine injections can reduce emergence agitation after

Table 1 – Patient demographics and clinical data.

Characteristic	Experimental group ($n = 129$)	Control group ($n = 129$)	Statistic	p value
Age, yr	7.8 ± 2.4	7.5 ± 2.4	t = 1.141	0.255
Sex, *n*				
Male	65	68	$\chi^2 = 0.140$	0.709
Female	64	61		
Duration of operation, min	28.8 ± 10.2	30.2 ± 10.9	t = −1.072	0.285
Duration of anaesthesia, min	50.3 ± 10.4	52.2 ± 12.6	t = −1.332	0.184
No. of extraocular muscles operated, *n*				
1	17	11	Z = −1.686	0.092
2	75	71		
3	23	25		
4	11	18		
5	3	4		

Table 2 – Incidence of emergence agitation, *n* (%).

Level	Experimental group ($n = 129$)	Control group ($n = 129$)
Mild	9 (7.0)	26 (20.2)
Moderate	5 (3.9)	14 (10.9)
Severe	2 (1.6)	2 (1.6)

strabismus surgery [10], though they can result in adverse reactions, such as subconjunctival haemorrhaging and penetrating eye injury, as well as prolong recovery time. The results of the present study show that proparacaine eye drops are also effective in reducing postoperative emergence agitation.

Proparacaine hydrochloride is a topical amino ester drug [11] that produces an anaesthetic effect via reducing the permeability of nerve cell membranes to sodium ions, resulting in nerve conduction block. Proparacaine is widely used in ophthalmic operations because of its few associated adverse effects and short acting time (15 min). The use of these drops can be considered safe, as the corneas in patients treated with proparacaine in our study were translucent and without epithelial exfoliation on the 1st postoperative day. However, despite the significant effect of proparacaine administration, a substantial proportion of children still had severe agitation during the recovery period. Thus, the observed emergence agitation may have been a result of stretching and suturing of extraocular muscles during the surgery in addition to the pain from the conjunctival incision. Preoperative anxiety and low degree of fasting tolerance may also cause emergence agitation, and therefore it deserves further study.

In conclusion, the use of anaesthetic eye drops is safe and effective for reducing emergence agitation in paediatric patients following strabismus surgery. However, additional pain relief methods may be needed to completely eliminate all contributing causes.

REFERENCES

[1] Yan HL, Gao JL. Pediatric ophthalmology. Beijing: People's Medical Publishing House; 2002. p. 337–415.
[2] Martin J. Post anaesthesia excitation. Pediatr Anesth 2002;12(4):293–5.
[3] Zhong BL, Li YC. Retrospective analysis of factors for emergence agitation in adults. Mod Prev Med 2012;39(11):2858–60.
[4] He XH. The causes of emergence agitation and nursing measures. Mod Clin Nurs 2009;8(8):47–9.
[5] Mizuno J, Nakata Y, Morita S, Arita H, Hanaoka K. Predisposing factors and prevention of emergence agitation. Masui 2011;60(4):425–35.
[6] Welborn LG, Hannallah RS, Norden JM, et al. Comparison of emergence and recovery characteristics of sevoflurane, desflurane, and halothane in pediatric ambulatory patients. Anesth Analg 1996;83(5):917–20.
[7] Kuratani N. Emergence agitation in paediatric anesthesia. Masui 2007;56(5):554–9.
[8] Liu X. Analysis of causes and nursing of 539 patients for emergence agitation after general anaesthesia. Chin J Nurs 2007;42(10):886–8.
[9] Wang ZW, Lian T, Zhu GZ. Analysis of factors for emergence agitation after general anaesthesia. J Mil Surg Southwest China 2013;15(4):440–2.
[10] Seo IS, Seong CR, Jung G, Park SJ, Kim SY, Kim MM. The effect of sub-Tenon lidocaine injection on emergence agitation after general anaesthesia in paediatric strabismus surgery. Eur J Anaesthesiol 2011;28(5):334–9.
[11] China food and drug administration. Clinical drug reference, vol. 53–4. Chengdu: Science and Technology of Sichuan Press; 2004. p. 56.